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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/750,443 | 12/30/2003 | Eric Neyret | 4717-8300 | 1763 |

28765 7590 02/11/2005

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PATENT DEPARTMENT
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| EXAMINER |
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DANG, PHUC T

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| ART UNIT | PAPER NUMBER |
|----------|--------------|

2818

DATE MAILED: 02/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/750,443 | NEYRET ET AL. | |
| | Examiner | Art Unit | |
| | PHUC T. DANG | 2818 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 15-20 is/are rejected.
- 7) ☒ Claim(s) 10-14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>123003</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

1. This application is a CON of PCT/FR02/02341 filed on July 4, 2002.

Oath/Declaration

2. The oath/declaration filed on December 30, 2003 is acceptable.

Priority

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

4. The office acknowledges receipt of the following items from the applicant:

Information Disclosure Statement (IDS) filed on December 30, 2003.

Specification

5. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 1-9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al., hereinafter "Akiyama" (U.S. Patent No. 6,680,260 B2).

Akiyama discloses a method for reducing by roughness of a free surface of a semiconductor wafer which comprises applying a rapid thermal annealing process under a pure argon atmosphere for a time sufficient to uniformly heat and smooth the free surface of the wafer [col. 12, lines 50-57].

Heating uniformly for a time sufficient to smooth the free surface of the wafer is considered to perform the heat treatment at the same temperature for a period of time as shown on col. 12, lines 65-57. Thus, it would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above teaching by Akiyama for a purpose of obtaining the wafer surface roughness with high productivity.

Regarding claim 2, Akiyama discloses prior to conducting rapid thermal annealing, implanting atoms under a face of a donor substrate to form a zone of weakness, bonding a stiffening substrate to the face, and detaching the donor substrate along the zone of weakness to form the wafer including the stiffening substrate and a useful layer [col. 3, lines 50-65].

Regarding claims 3-4, Akiyama discloses a step further comprising rapid thermal annealing at a high temperature dwell in the range of about 1000°C to 1400°C, for a period in the range of about 1 second to 60 seconds and the high temperature dwell is in the range of about 1100°C to 1250°C for a period in the range of about 5 seconds to 30 seconds [Abstract].

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Regarding claim 5, Akiyama discloses a step of polishing the wafer after the rapid thermal annealing [col. 9, lines 29-35].

Regarding claim 6, Akiyama discloses a step of implementing at least one sacrificial oxidation stage to reduce slip lines in the free surface of the wafer [col. 4, lines 42-59].

Regarding claims 7-8, Akiyama discloses the sacrificial oxidation stage is conducted prior and after to the rapid thermal annealing [col. 10, lines 1-29].

Regarding claim 9, Akiyama discloses a first sacrificial oxidation stage is conducted prior to the rapid thermal annealing, and a second sacrificial oxidation stage is conducted after the rapid thermal annealing [col. 10, lines 1-29].

Regarding claim 15, Akiyama discloses a step of forming a silicon-on-insulator structure having a free surface with enhanced smoothness [Abstract].

7. Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy (U.S. Patent No. 5,856,027) in view of Thakur et al., hereinafter "Thakur" (U.S. Patent No. 5,738,909).

Regarding claims 16-17, Murphy discloses a method for reducing roughness of a free surface of a wafer of semiconductor material which comprises: .

- placing a wafer into a chamber;

- introducing an annealing atmosphere of pure argon into the chamber at a predetermined pressure of a few millitorr up to atmosphere pressure;

- heating the chamber to increase temperature inside the chamber at a predetermined rate up to a treatment temperature;

- maintaining the wafer in the chamber at the treatment temperature for a duration

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of a high-temperature dwell [col. 6, lines 34-41].

Murphy discloses all the features of the claimed invention as discussed above, but does not disclose a step of cooling the wafer at a rate of several tens of degrees Celsius per second.

Thakur, however, discloses a step of cooling the wafer at a rate of several tens of degrees Celsius per second [col. 6, lines 9-16].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the teaching of Thakur to Murphy discussed above such that cooling the wafer at a rate of several tens of degrees Celsius per second for a purpose of reducing the free roughness.

Regarding claim 18, Thakur discloses the predetermined heating rate is about 50°C per second [col. 4, lines 30-39].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to apply the teaching of Thakur to Murphy discussed above such that the predetermined heating rate is about 50°C per second for a purpose of reducing the free roughness.

Regarding claim 19, Murphy discloses heating by rapid thermal in dwell in the range of about 1000°C to 1400°C for a period annealing at a high temperature in the range of about 1 second to 60 seconds [col. 6, lines 34-41].

Regarding claim 20, Thakur discloses the cooling occurs by means of a flow air [col. 7, lines 54-59].

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It would have been obvious to one having ordinary skilled in the art at the time the invention was made to apply the teaching of Thakur to Murphy discussed above such that the cooling occurs by means of a flow air for a purpose of reducing the free roughness.

Allowable Subject Matter

8. The following is a statement of reason for the indication of allowable subject matter:

Claims 10-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

None of the Prior Art made of record discloses further comprises conducting a polishing stage after the rapid thermal annealing and prior to the second sacrificial oxidation stage to further enhance the surface smoothness as cited in claim 10 and the rapid thermal annealing is followed by a first sacrificial oxidation stage, a polishing stage and a second sacrificial oxidation stage to further enhance free surface smoothness after the rapid thermal annealing as cited in claim 11 and further comprises another rapid thermal annealing stage under pure argon after polishing to further enhance free surface smoothness as cited in claim 12 and further comprises conducting a first sacrificial oxidation stage prior to the polishing stage as cited in claim 13 and further comprises conducting a second sacrificial oxidation stage after the polishing stage as cited in claim 14.

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Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuc T. Dang whose telephone number is (571) 272-1776. The examiner can normally be reached on 8:00 am-5:00 pm.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Nelms can be reached on (571) 272-1787. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and After Final communications.

11. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Phuc T. Dang

Primary Examiner

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PD 